Abstract Submitted
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Extracting current induced spins from topological insulator wires: gate control of extracted spin polarization[1] INANC ADAGIDELI, Sabanci University — Spin-momentum locking featured by the surface states of 3D topological insulators (TIs) allows electrical generation of spin accumulations and provides a new avenue for spintronics applications. In this work [1], we explore how to extract electrically induced spins from topological insulator surfaces, where they are generated into topologically trivial metallic leads that are commonly used in conventional electronic devices. We first focus on an effective surface theory of current induced spin accumulation in topological insulators. Then we focus on a particular geometry: a metallic pocket attached to top and side faces of a 3D topological insulator quantum wire with a rectangular cross section, and explore spin extraction into topologically non-trivial materials. We find surprisingly that the doping in and/or a gate voltage applied to the metallic side pocket can control the direction of the extracted spin polarization opening the possibility for a spin transistor operation of these device geometries. We also perform numerical simulations of nonequilibrium spin accumulations generated by an applied bias in the same geometry and demonstrate the spin polarization control via applied gate voltages. [1] A. Asgharpour, C. Gorini, K.Richter, I. Adagideli

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